METTLER TOLEDO

Operation Manual
Transmitter M300 FLOW

Transmitter M300 FLOW
52 121 319

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1 Introduction

Statement of Intended Use – The M300 Flow transmitter is a single- or four- channel online process instrument for measuring conductivity or resistivity of fluids. It will interface with a variety of different Mettler-Toledo sensors, which connect to the transmitter using cables of varied lengths.

A large four line backlit Liquid Crystal Display conveys measuring data and setup information. The menu structure allows the operator to modify all operational parameters by using keys on the front panel. A menu-lockout feature, with password protection, is available to prevent the unauthorized use of the meter. The single channel M300 transmitter can be configured to use its two analog and/or four relay outputs for process control. The four channel model uses four analog and/or six relays.

The M300 transmitter is equipped with a USB communication interface. This interface provides real-time data output and complete instrument configuration capabilities for central monitoring via Personal Computer (PC).

2 Safety instructions

This manual includes safety information with the following designations and formats.

2.1 Definition of equipment and documentation symbols and designations

WARNING: POTENTIAL FOR PERSONAL INJURY.

CAUTION: possible instrument damage or malfunction.

NOTE: Important operating information.

On the transmitter or in this manual text indicates: Caution and/or other possible hazard including risk of electric shock (refer to accompanying documents)

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The following is a list of general safety instructions and warnings. Failure to adhere to these instructions can result in damage to the equipment and/or personal injury to the operator.

- The M300 Transmitter should be installed and operated only by personnel familiar with the transmitter and who are qualified for such work.
- The M300 Transmitter must only be operated under the specified operating conditions (see section 16).
- Repair of the M300 Transmitter must be performed by authorized, trained personnel only.
- With the exception of routine maintenance, cleaning procedures or fuse replacement, as described in this manual, the M300 Transmitter must not be tampered with or altered in any manner.
- Mettler-Toledo accepts no responsibility for damage caused by unauthorized modifications to the transmitter.
- Follow all warnings, cautions, and instructions indicated on and supplied with this product.
- Install equipment as specified in this instruction manual. Follow appropriate local and national codes.
- Protective covers must be in place at all times during normal operation.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

WARNINGS:

Installation of cable connections and servicing of this product require access to shock hazard voltage levels.
Main power and relay contacts wired to separate power source must be disconnected before servicing.
Switch or circuit breaker shall be in close proximity to the equipment and within easy reach of the OPERATOR; it shall be marked as the disconnecting device for the equipment.
Main power must employ a switch or circuit breaker as the disconnecting device for the equipment.
Electrical installation must be in accordance with the National Electrical Code and/or any other applicable national or local codes.

RELAY CONTROL ACTION: the M300 transmitter relays will always de-energize on loss of power, equivalent to normal state, regardless of relay state setting for powered operation. Configure any control system using these relays with fail-safe logic accordingly.

PROCESS UPSETS: Because process and safety conditions may depend on consistent operation of this transmitter, provide appropriate means to maintain operation during sensor cleaning, replacement or sensor or instrument calibration.

2.2 Correct disposal of the unit

When the transmitter is finally removed from service, observe all local environmental regulations for proper disposal.

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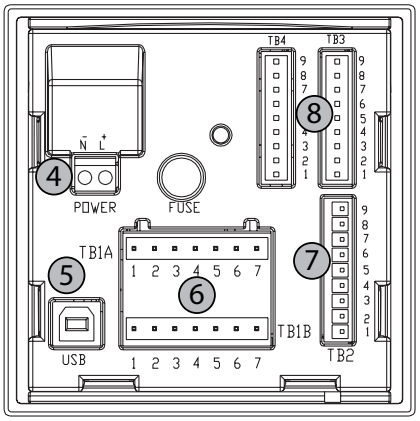
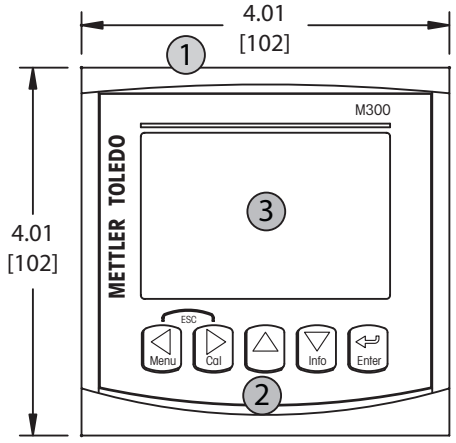
3 Unit overview

M300 models are available in both a 1/4DIN and 1/2DIN case size. The 1/4DIN is a panel-mount only design and the 1/2DIN models provides an integral P65 housing for wall-, or pipe-mount.

3.1 Overview 1/4DIN





1 – Hard Polycarbonate case
2 – Five Tactile-Feedback Navigation Keys
3 – Four-line LCD Display
4 – Power Supply Terminals
5 – USB Interface Port
6 – Relay Output Terminals
7 – Analog Output/Digital Input Terminals
8 – Sensor Input Terminals (TB 4 available on dual-channel units only)

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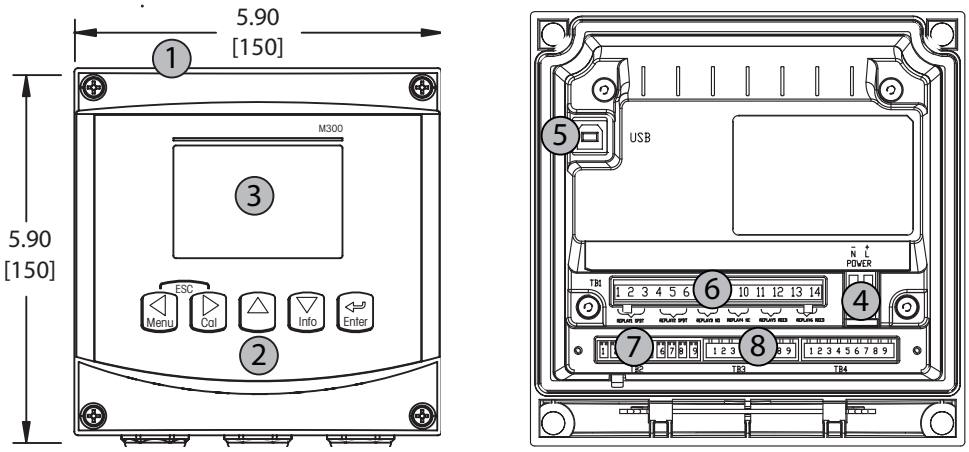
3.2 Overview 1/2DIN



1 – Hard Polycarbonate case
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3 – Four-line LCD Display
4 – Power Supply Terminals
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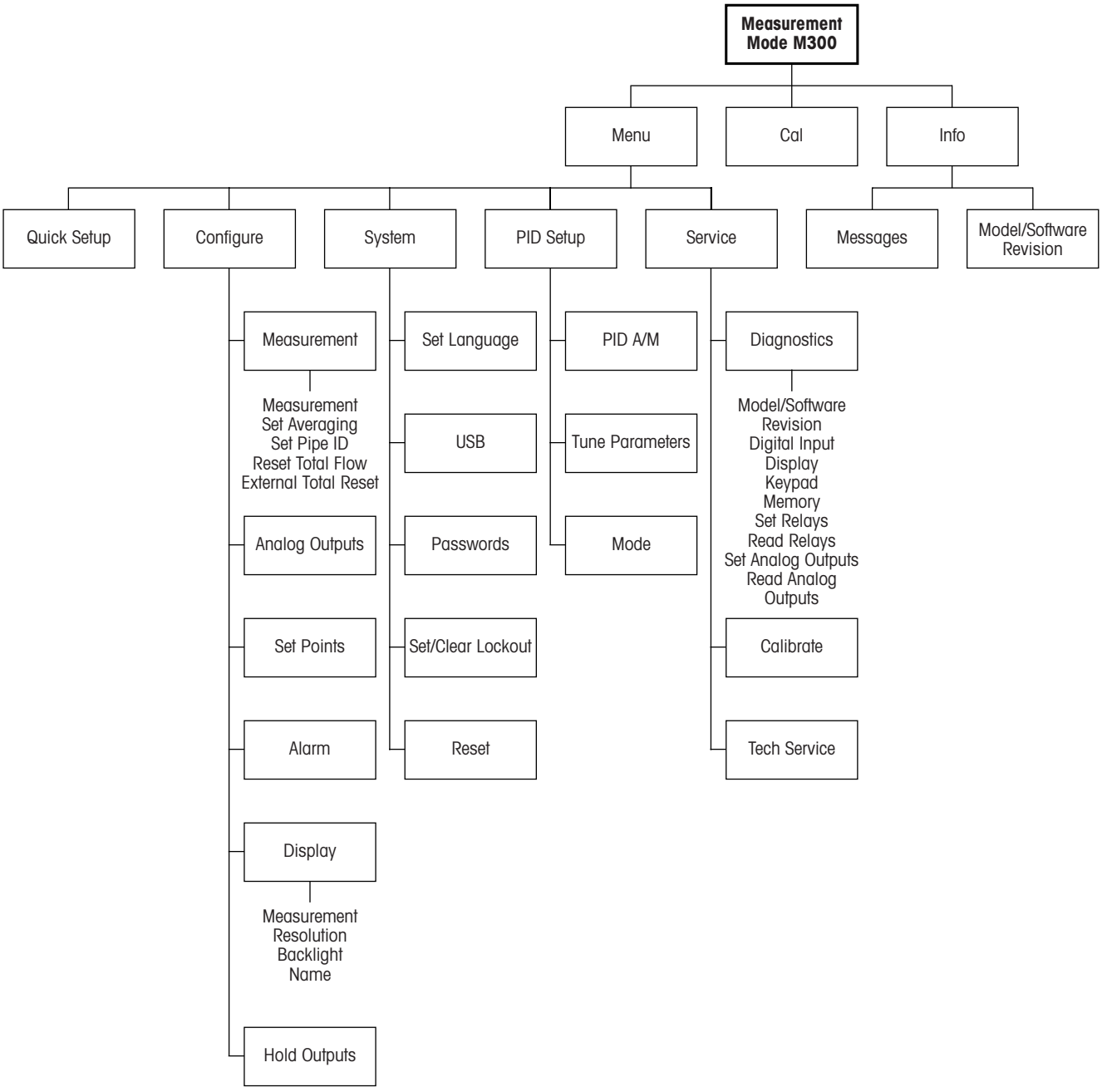
3.3 Control/Navigation Keys

3.3.1 Menu Structure

Below is the structure of the M300 menu tree:



3.3.2 Navigation keys

3.3.2.1 Navigating the menu tree

Enter the desired main Menu branch with the ◀, ▶ or ▲ keys. Use the ▲ and ▼ keys to navigate through the selected Menu branch.

☞ **NOTE:** In order to back up one menu page, without escaping to the measurement mode, move the cursor under the UP Arrow character at the bottom right of the display screen and press [Enter].

3.3.2.2 Escape

Press the ◀ and ▶ key simultaneously (escape) to return to the Measurement mode.

3.3.2.3 Enter

Use the ↵ key to confirm action or selections.

3.3.2.4 Menu

Press the ◀ key to access the main Menu.

3.3.2.5 Calibration mode

Press the ▶ key to enter Calibration Mode.

3.3.2.6 Info mode

Press the ▼ key to enter Info Mode

3.3.3 Navigation of data entry fields

Use the ▶ key to navigate forward or the ◀ key to navigate backwards within the changeable data entry fields of the display.

3.3.4 Entry of data values, selection of data entry options

Use the ▲ key to increase or the ▼ key to decrease a digit. Use the same keys to navigate within a selection of values or options of a data entry field.

☞ **NOTE:** Some screens require configuring multiple values via the same data field (ex: configuring multiple setpoints). Be sure to use the ▶ or ◀ key to return to the primary field and the ▲ or ▼ key to toggle between all configuration options before entering to the next display screen.

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3.3.5 Navigation with ↑ in Display

If a ↑ is displayed on the bottom right hand corner of the display, you can use the ▶ or the ◀ key to navigate to it. If you click [ENTER] you will navigate backwards through the menu (go back one screen). This can be a very useful option to move back up the menu tree without having to exit into the measuring mode and re-enter the menu.

3.3.6 "Save changes" dialog

Three options are possible for the "Save changes" dialog: Yes & Exit (Save changes and exit to measuring mode), "Yes & ↑" (Save changes and go back one screen) and "No & Exit" (Don't save changes and exit to measuring mode). The "Yes & ↑" option is very useful if you want to continue configuring without having to re-enter the menu.

3.3.7 Security Passwords

The M300 transmitter allows a security lock-out of various menus. If the security lock-out feature of the transmitter has been enabled, a security password must be entered to allow access to the menu. See section 9.3 for more information.

3.4 Display

NOTE: In the event of an alarm or other error condition the M300 Transmitter will display a flashing ⚠ in the upper right corner of the display. This symbol will remain until the condition that caused it has been cleared.

NOTE: During calibrations, clean, Digital In with Analog Output/Relay/USB in Hold state, a flashing H will appear in the upper left corner of the display. This symbol will remain for 20 seconds until after the calibration or clean is completed .This symbol will also disappear when Digital In is deactivated.

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4 Installation instruction

4.1 Unpacking and inspection of equipment

Inspect the shipping container. If it is damaged, contact the shipper immediately for instructions. Do not discard the box.

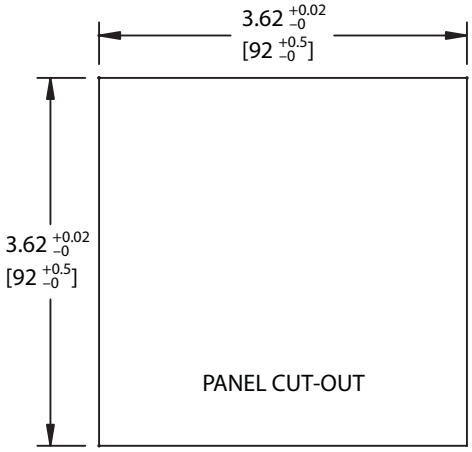
If there is no apparent damage, unpack the container. Be sure all items shown on the packing list are present.
If items are missing, notify Mettler-Toledo immediately

4.1.1 Panel cutout dimensional information – 1/4DIN models

1/4DIN Model transmitters are designed for panel-mount installation only. Each transmitter is supplied with mounting hardware to provide fast and simple installation to a flat panel or flat enclosure door. To insure a good seal and maintain IP integrity of installation, the panel or door must be flat and have a smooth finish. Hardware consists of:

Two – Snap-on Mounting brackets
One – Mounting gasket seal

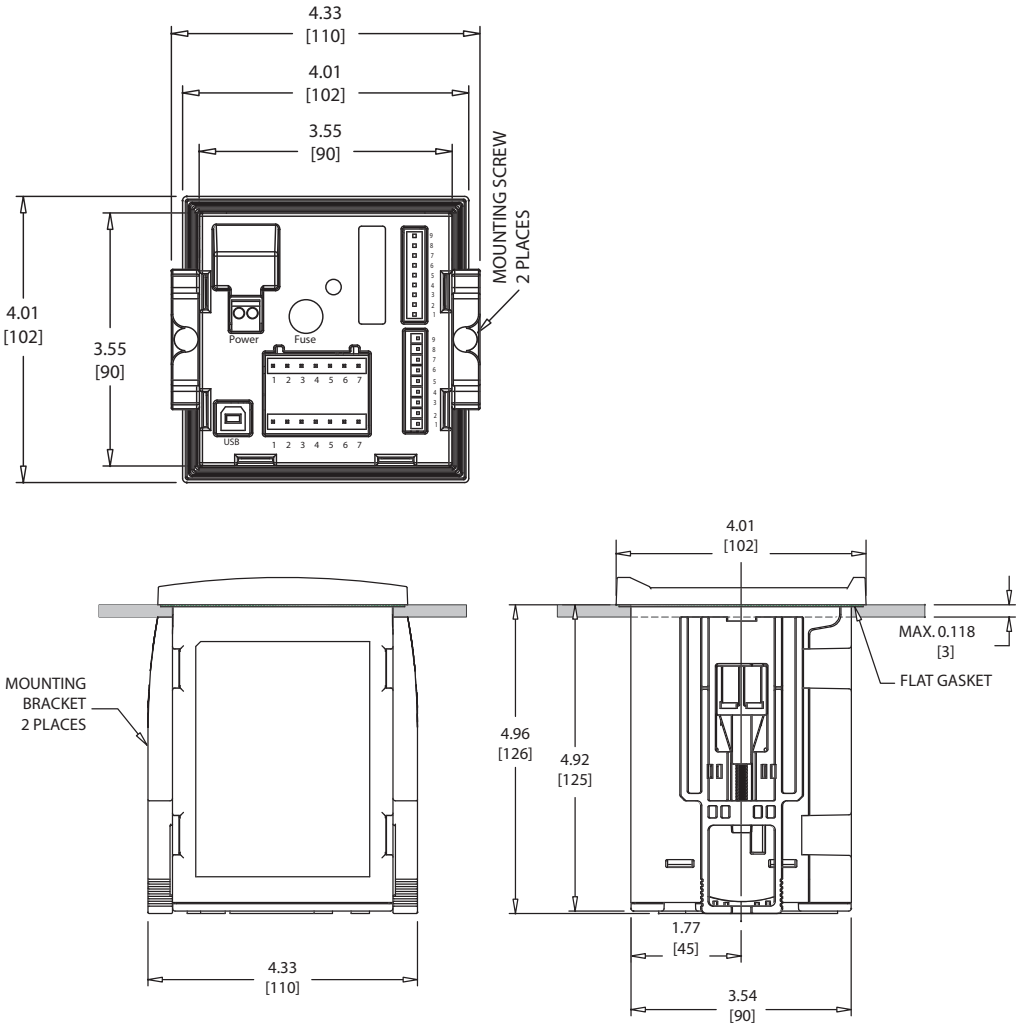
Transmitter dimensions and mounting are shown in figures below.



4.1.2 Installation procedure – 1/4DIN models

- Make cutout in panel (see dimensions cutout drawing).
- Be sure surface surrounding cutout is clean, smooth and free of burrs.
- Slide face gasket (supplied with transmitter) around transmitter from the back of the unit.
- Place transmitter into cutout hole. Be sure there are no gaps between the transmitter and panel surface.
- Place the two mounting brackets on either side of the transmitter as shown
- While holding transmitter firmly into the cutout hole, push the mounting brackets toward the backside of panel
- Once secure, use a screwdriver to tighten the brackets against the panel
- Face gasket will compress between transmitter and panel

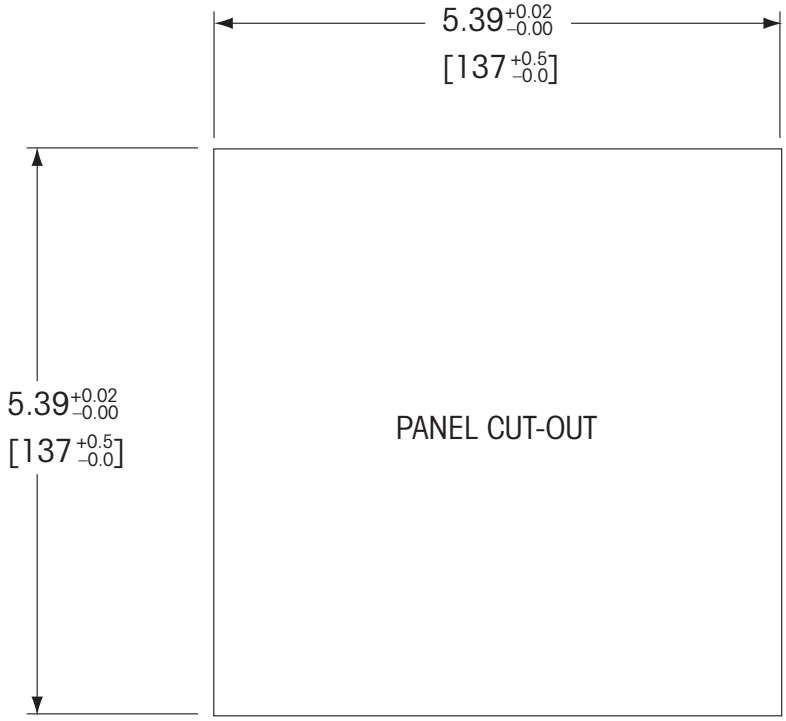
CAUTION: Do not over tighten brackets



4.1.3 Panel cutout dimensional information – 1/2DIN models

1/2DIN Model transmitters are designed with an integral rear cover for stand-alone wall mount installation.
The unit may also be wall mounted using the integral rear cover. See installation instructions in Section 4.1.4.

Below are cut-out dimensions required by the 1/2DIN models when mounted within a flat panel or on a flat enclosure door. This surface must be flat and smooth. Textured or rough surfaces are not recommended and may limit the effectiveness of the gasket seal provided.



Optional hardware accessories are available that allow for panel- or pipe-mount.
Refer to Section 15 for ordering information.

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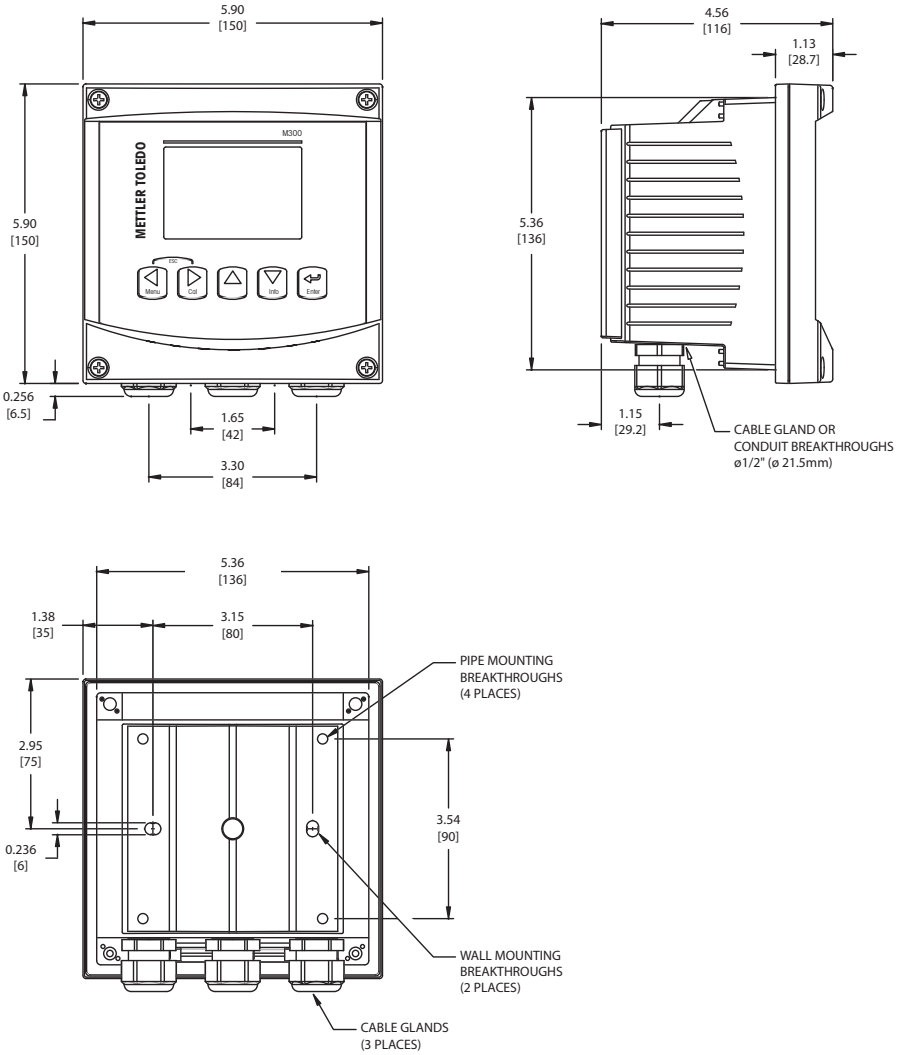
4.1.4 Installation procedure – 1/2DIN models

For Wall Mount:

- Remove rear cover from front housing.
- Start by unscrewing the four screws located on the face of the transmitter, in each corner. This allows the front cover to swing away from the rear housing.
- Remove the hinge-pin by squeezing the pin from each end. This allows the front housing to be removed from the rear housing
- Drill out wall-mount breakthroughs in the rear housing.
- Mount rear housing to wall using appropriate mounting hardware for wall surface. Be sure it is level and securely fastened and the installation adheres to any and all clearance dimensions required for transmitter service and maintenance.
- Insert two black protective covers (supplied with the M300 transmitter) over the fixing hardware and into the space on the inside back cover, as shown in the drawing below. This is necessary to maintain unit integrity.
- Replace the front housing to the rear housing. The unit is ready to be wired.

For Pipe Mount:

- Use only manufacturer-supplied components for pipe-mounting the M300 transmitter and install per the supplied instructions. See section 15 for ordering information.



4.2 Connection of power supply

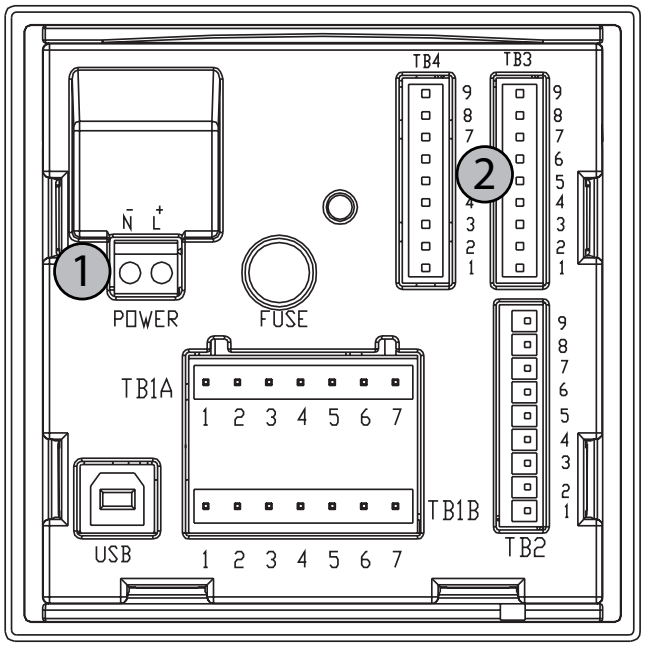
All connections to the transmitter are made on the rear panel of all models.

Be sure power to all wires is turned off before proceeding with the installation. High voltage may be present on the input power wires and relay wires.

A two-terminal connector on the rear panel of all M300 models is provided for power connection. All M300 models are designed to operate from a 20–30 VDC or a 100 to 240 VAC power source. Refer to specifications for power requirements and ratings and size power wiring accordingly.

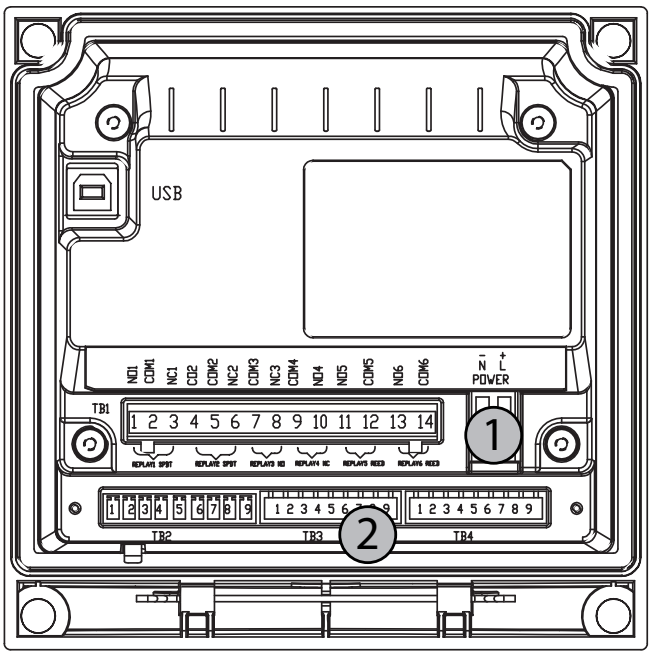
The terminal block for power connections is labeled "Power" on the rear panel of the transmitter. One terminal is labeled **–N** for the Neutral wire and the other **+L** for the Line (or Load) wire. There is no earth ground terminal on the transmitter. For this reason the internal power wiring within the transmitter is double insulated and the product label designates this using the ⧈ symbol.

4.2.1 1/4DIN housing (panel mount)



1 Connection of power supply
2 Terminal for sensor

4.2.2 1/2DIN housing (wall mount)



1 Connection of power supply
2 Terminal for sensor

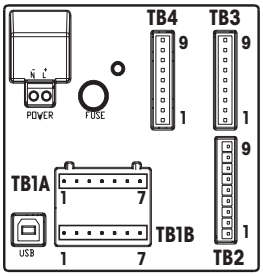
4.3 Connector PIN definition

4.3.1 TB1 and TB2 for 1/2DIN and 1/4DIN versions

Power connections are labeled **–N** for Neutral and **+L** for Line, for 100 to 240 VAC or 20 – 30 VDC.

¼ DIN

TB2 for ¼ DIN	
1	AO1+
2	AO1–/AO2–
3	AO2+
4	AO3+*
5	AO3–/AO4–*
6	AO4+*
7	DI1+
8	DI1–/DI2–*
9	DI2+*

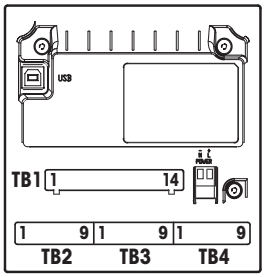


TB1A for ¼ DIN	
1	NO2
2	COM2
3	NC2
4	NO6*
5	COM6*
6	NO4
7	COM4

TB1B for ¼ DIN	
1	NO1
2	COM1
3	NC1
4	NC5*
5	COM5*
6	NO3
7	COM3

½ DIN

TB2 for ½ DIN	
1	AO1+
2	AO1–/AO2–
3	AO2+
4	AO3+*
5	AO3–/AO4–*
6	AO4+*
7	DI1+
8	DI1–/DI2–*
9	DI2+*



TB1 for ½ DIN			
1	NO1	8	NC5*
2	COM1	9	COM6*
3	NC1	10	NO6*
4	NO2	11	NO3
5	COM2	12	COM3
6	NC2	13	NO4
7	COM5*	14	COM4

* Dual channel only

NO = normally open (contact open if un-actuated).
NC = normally closed (contact closed if un-actuated).

4.3.2 TB3 and TB4 for 1/2DIN and 1/4DIN versions

TB3 and TB4 are used for sensor inputs.

TB3			
Pin no.	**Transmitter**		**Function**
	TB3	TB4*	
1	–		Not used
2	GND		Ground
3	BJ*	DJ*	+10 VDC
4	Bin*	Din*	Flow Pulse Input
5	+5V		+ 5 VDC
6	GND		Ground
7	AJ	CJ*	+ 10 VDC
8	AIn	CIn*	Flow Pulse Input
9	+5V		+ 5 VDC

* Four channel models only

AJ and AIN refer to connections for channel A.

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4.4 Connection of Sensor

The M300 FLOW Transmitter is designed to operate with various types of sensors. These sensors require different wiring configurations. Listed below are instructions for wiring the various types of sensors offered by Mettler-Toledo Thornton for use with this transmitter. Please consult the factory for assistance if attempting to wire sensors not offered by Mettler-Toledo Thornton as some sensors may not be compatible.

4.5 Flow Sensor Input Wiring Kit

This kit contains components that may be needed at input terminals to condition sensor signals. Refer to the following sections or to the instruction manual for wiring details.

4.6 Kit Contents

This kit contains the following items:
- 4x Wire nuts
- 4x 10K ohm resistors for use with Burket 8020 and 8030 type sensors, and GF Signet 2500-series sensors.
- 4x 1K ohm resistors for use with Data Industrial 200-series and Fluidyne insertion type sensors.
- 4x 0.33uF, 50 V capacitors for use with Berket 8020 and 8030 type sensors, Data Industrial 200-series and 4000-series sensors, GF Signet 2500-series sensors, Sanitary Turbine-Type sensors, Fluidyne insertion type sensors and Racine Federated (Formerly Asahi/ America) vortex-style sensors.

4.7 Flow sensor wiring for Compatible Sensors

The following sections provide wiring information to properly connect various compatible flow sensors to the M300 FLOW Transmitter. When using the Configuration menu of the transmitter to setup the flow sensor, the first prompt asks to select the TYPE of flow sensor being connected.

There are three choices as follows:
High: All flow sensors described in Section 4.5.1
Low: P515 Signet flow sensors only, described in section 4.5.2
Type 2: Asahi flow sensors, described in Section 4.5.3

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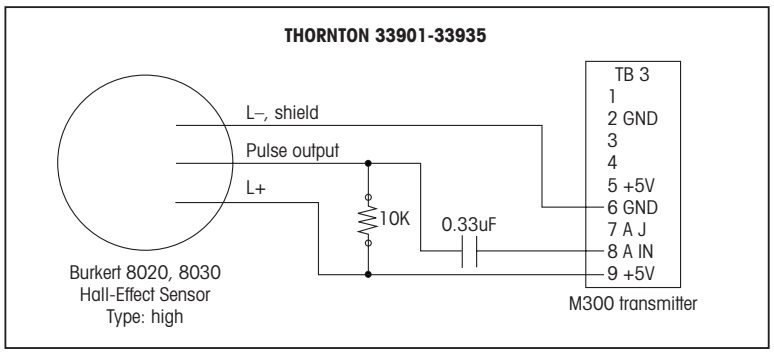
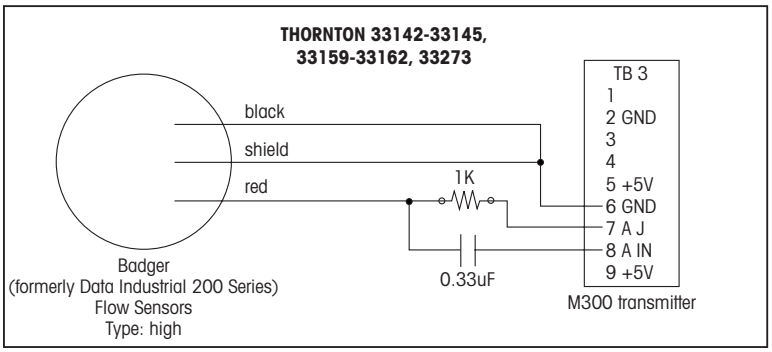
4.7.1 Wiring for "HIGH" type flow sensors

The following wiring information is used when connecting (Burkert 8020 and 8030 type) inline Hall effect 5VDC, flow sensors. **Thornton models 33901 thru 33935.**



Extension cable not provided. Use 2-conductor twisted pair with shield, 22 AWG (Belden 8451 or equivalent), 1,000 ft (305 m) maximum length.

The following wiring information is used when connecting Badger (formerly Data Industrial 200-Series) forward-swept paddlewheel type flow sensors.
Thornton models 33142 thru 33145 and 33159 thru 33162 and 33273.



Extension cable provided with sensor. Use 2-conductor twisted pair with shield 20AWG (Belden 9320 or equivalent) to extend length to 2000 ft (610 m) max.

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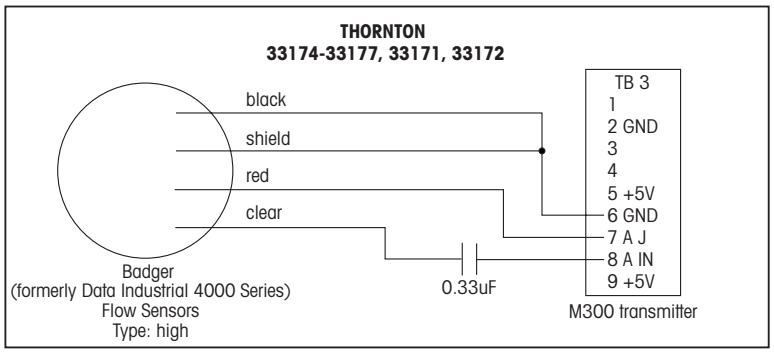
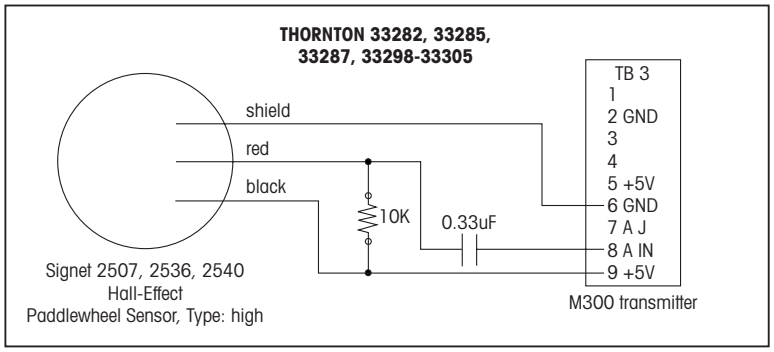
The following wiring information is used when connecting Badger (formerly Data Industrial 4000-Series) forward-swept paddlewheel type flow sensors.
Thornton models 33174 thru 33177 and 33171 and 33172.



20 ft (6.1 m) extension cable provided with sensor. Use 3-conductor with shield, 20 AWG (Belden 9364 or equivalent) to extend length to 2000 ft (610 m) maximum.

The following wiring information is used when connecting (GF Signet 2500-Series) Hall Effect paddlewheel type flow sensors. **Thornton models 33282, 33285, 33287, 33298 thru 33305.**



25 ft (7.6 m) extension cable provided with sensor. Use 2-conductor with shield, 22 AWG (Belden 8451 or equivalent) to extend length to 1000 ft (305 m) maximum.

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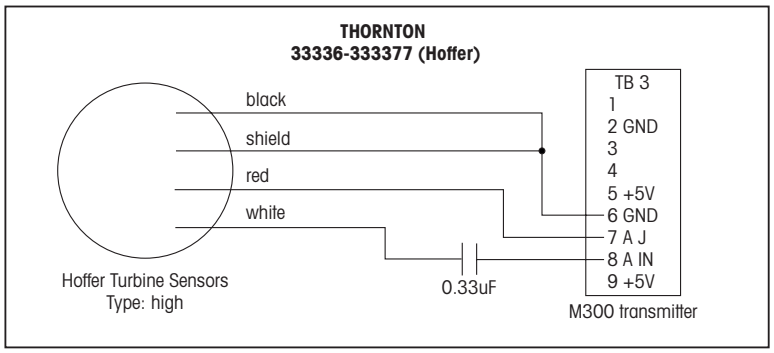
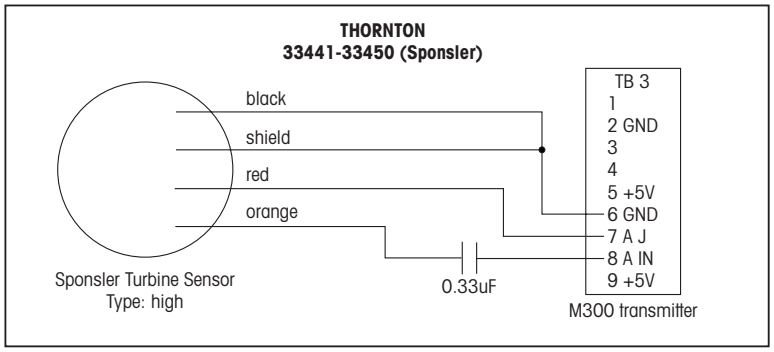
The following wiring information is used when connecting Sanitary Turbine type flow sensors.
Thornton models 33336 thru 33377 (Hoffer) and 33441 thru 33450 (Sponsler).



20 ft (6.1 m) extension cable provided with sensor. Use 3-conductor with shield, 20 AWG (Belden 9364 or equivalent) to extend length to 3000 ft (915 m) maximum.



20 ft (6.1 m) extension cable provided with sensor. Use 3-conductor with shield, 20 AWG (Belden 9364 or equivalent) to extend length to 3000 ft (915 m) maximum.

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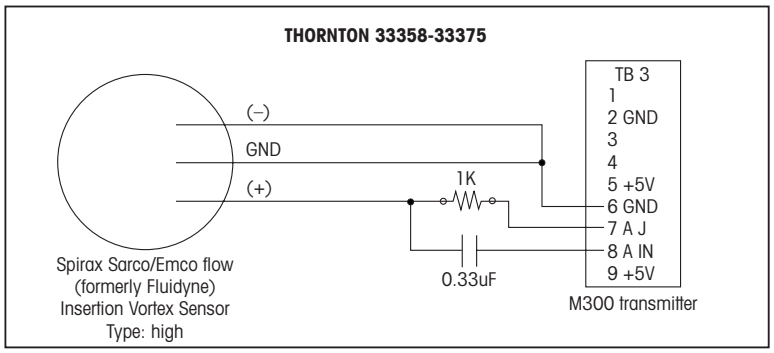
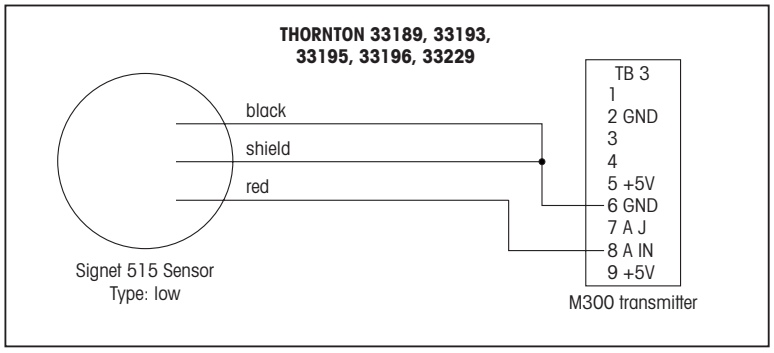
The following wiring information is used when connecting Spirax Sarco/Emco flow (formerly Fluidyne) insertion type flow sensors. **Thornton models 33358 thru 33375.**



Extension cable not provided. Use 2-conductor twisted pair with shield, 20 AWG (Belden 9320 or equivalent), 2000 ft (610 m) maximum length.

4.7.2 Wiring for "LOW" type flow sensors

The following wiring information is used when connecting (GF Signet 515) type flow sensors. **Thornton models 33189, 33193, 33195, 33196, and 33229.**



Extension cable not provided. Use 2-conductor twisted pair with shield, 22 AWG (Belden 8451 or equivalent, 200 ft (61 m) maximum length.

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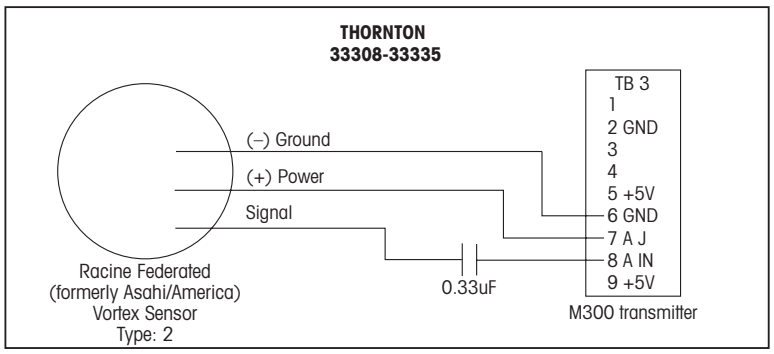
4.7.3 Wiring for "TYPE 2" flow sensors

The following wiring information is used when connecting Racine Federated (formerly Asahi/ America) vortex flow sensors. **Thornton models 33308 to 33335.**



Extension cable not provided. Use 3-conductor with shield, 20 AWG (Belden 9364 or equivalent), 1000 ft (305 m) maximum length.

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5 Placing in/out of service

5.1 Placing transmitter in service

After connecting the transmitter to power supply circuit, it will be active as soon as the circuit is powered.

5.2 Placing transmitter out of service

First disconnect the unit from the main power source then disconnect all remaining electrical connections. Remove the unit from the wall/panel. Use the installation instruction in this manual as reference for dis-assembling mounting hardware.

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6 Quick Setup

(PATH: Menu/Quick Setup)

Quick Setup allows limited configuration of the most common functions of the M300 Flow transmitter. Detailed information for each function can be found in the individual sections of the manual.

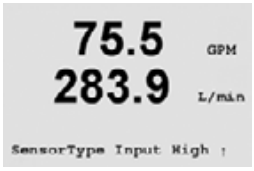
6.1 Enter Quick Setup mode

Select Quick Setup and press the [ENTER] key. Enter the security code if necessary (see section 9.3)

Note: Refer to section 3.3 for information on menu navigation.

While in Measurement mode press the [MENU] key to bring up the Menu selection. Select Quick Setup and press the [ENTER] key.
Convention:
1st line on display => a
2nd line on display => b
3rd line on display => c
4th line on display => d
Only lines a and b on single channel models or lines a and c on dual channel models can be configured in Quick Setup. Go to the Configuration Menu to configure remaining lines.

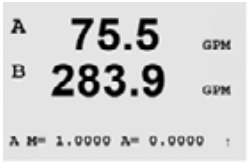
6.2 Flow Sensor Type Selection



Refer to Section 4.5 for Flow sensor type information. Select the desired flow sensor type.

When configuring four channel transmitters, also select the channel A, B, C or D to be configured. Press [ENTER]

6.3 Calibration Constant Entry



Enter the calibration constants from the sensor label or certificate. For sensor types High and Low a Multiplier "M" and Adder "A" are entered.

For sensor Type 2, a Multiplier "M" followed by a table of K and F values are entered. Pressing [ENTER] will bring up the additional K and F factors. Press [ENTER] again to continue.

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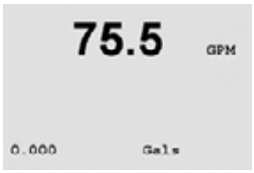
6.4 Measurement Selection

Select the desired display line (a or c) of the single channel transmitter to configure the values to be displayed and whether this value will have an Analog Output.

Convention (single channel models):
1st line on display => a
3rd line on display => c



Example:
By selecting a and GPM as units, the flow rate value will be displayed on the 1st line.
By selecting c and Gals as units, the total flow value will be displayed on the 3rd line of the display which has high resolution.
Selecting None means the display will be blank for the line selected.

Four channel transmitters, configure the channel followed by the measurement units.

Convention (four channel models only):
1st line on display => Channel A
2nd line on display => Channel B
3rd line on display => Channel C
4th line on display => Channel D

6.5 Analog Outputs

By selecting Analog Output Yes on the previous screen a linear 4–20 mA analog output Aout will be setup for the measurement when [ENTER] is pressed. Selecting No means that no analog output is setup. Aout min and Aout max are the minimum and maximum measurement values for the 4 and 20mA values respectively.
Analog Output defaults for Quick Setup:
Measurement a => Aout 1
Measurement c => Aout 2
Measurement A => Aout 1
Measurement B => Aout 2
Measurement C => Aout 3
Measurement D => Aout 4

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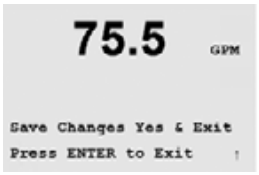
6.6 Set Points

After configuring the Analog Output a Set Point can be configured for that output. If No is selected and [ENTER] is pressed then the Quick Setup is done and the menus are exited without setting any Set Point.

Selecting Yes and pressing [ENTER] means a Set Point can be configured. Following Set Point Types can be selected:
Off (Set Point is Off)
High (High value has to be set)
Low (Low value has to be set)
Outside (High and Low value has to be set)
Between (High and Low value has to be set)
Total Flow (Available only if units of total flow are chosen. A Total Flow value has to be set)

After setting the Set point value(s) a Relay (none (blank), 1, 2, 3, 4) can be configured for that Set Point. The Relay delay is set to 10 seconds and the Hysteresis is set to 5%.



Press [ENTER] to bring up the Save Changes dialog.

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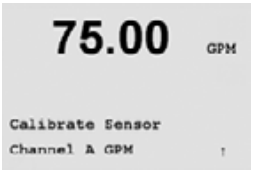
7 Calibration

(PATH: Cal)

The calibration key ▶ allows the user one-touch access to the calibration features of the transmitter.

7.1 Enter Calibration Mode



While in Measurement mode press the ▶ key. Enter the security code if necessary (see section 9.4) Press the ▲ or ▼ key to select the type of calibration desired. The options are "Sensor", "Meter", or "Analog".

NOTE: To exit Calibration mode at any time press the ◀ and ▶ keys simultaneously (Escape). The transmitter returns to the Measurement mode and the old calibration values remain active.

NOTE: If only Calibrate Sensor function is accessible, the Calibrate Unlock function is set to "No". To access all calibration functions using the one-touch Cal key, go to Service/Calibrate menu and change Unlock setting to "Yes". Refer to Section 11.2 for Meter and Analog calibration instructions and for instructions to unlock calibration functions for Cal key. [Analog and Meter calibration are always accessible in the Service/Calibrate menu]

NOTE: During calibration, the outputs will default to be held at their current values until 20 seconds after the calibration menu is exited. A flashing H appears in the upper left corner of the display while outputs are held. Refer to Section 8.7 Hold Outputs to change the hold output status.

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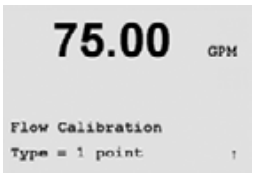
7.2 Sensor Calibration

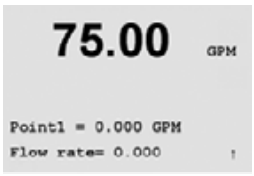
This feature provides the ability to perform a One-point or Two-point Sensor flow calibration and "Edit" or "Verify" saved calibration constants. The most common method of calibration for flow sensors is to enter the calibration constants appropriate for the sensor using the Edit function. Some users may choose to perform an in-line calibration using a One-point or Two-point Sensor flow calibration. This requires an external reference system. When performing an in-line calibration on a flow sensor, results will vary depending on the methods and calibration apparatus used to perform the calibration.

Select the channel (four channel models only) and the desired calibration option. Choices are GPM, meters/hour or liters/minute (for a one-pt or two-pt flow calibration), Edit and Verify. Press [ENTER]

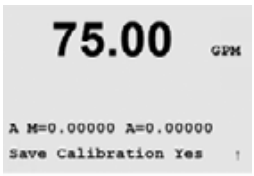
7.2.1 One point calibration



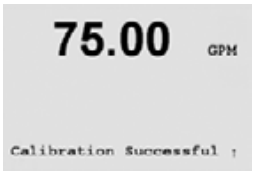
Select 1 point Calibration by pressing the ▲ or ▼ key followed by the [ENTER] key.



Enter the Value of calibration Point 1 from the external reference system and press the [ENTER] key to start calibration. The value in the 2nd text line is the actual measured value from the sensor prior to calibration.



After the calibration, the slope (Multiplier) calibration factor M and the offset (Adder) calibration factor A are displayed.



Select Yes to save the calibration values and the successful Calibration is confirmed on the display. Select No to discard the entered calibration. The meter retains the old calibration values and returns to the Measurement mode.

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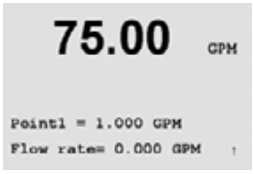
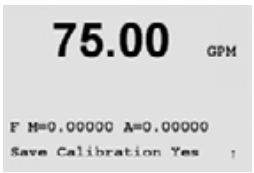
7.2.2 Two point Calibration

Enter the Sensor Calibration mode as described in section 7.2. Select 2 point Calibration followed by the [ENTER] key.

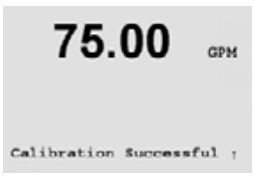


Enter the Value of Point 1 from the external reference system and press [ENTER]. Change the flow rate to another value. For best results, the change in flow rate should be as large as practical. The change in flow rate may be either high to low or low to high.

Enter the Value of Point 2 from the external reference system and press [ENTER] to start the calibration.



After the calibration, the slope (Multiplier) calibration factor M and the offset (Adder) calibration factor A are displayed.



Select Yes to save the net calibration values and the successful Calibration is confirmed on the display. Select No to discard the entered calibration. The meter retains the old calibration values and returns to the Measurement mode.

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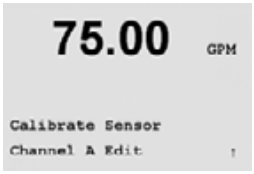
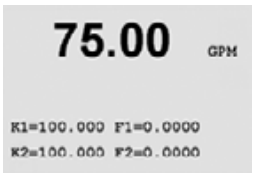
7.3 Edit



The Edit function is the most commonly used calibration method for flow sensors.

Enter Calibration mode as described in section 7.1 and select the channel (four channel models only) and select Edit.

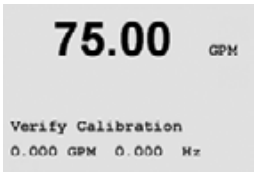
Press [ENTER] to display all calibration constants for the sensor. The calibration constants can be changed in this menu. If the sensor type previously selected was either High or Low, the M and A values will be displayed. If Type 2 was selected a table of K and F values will be displayed.



Press [ENTER] until prompted to save calibration values
Select Yes to save the new calibration values and the successful Calibration is confirmed on the display.

7.4 Verify

Enter Calibration mode as described in section 7.1 and select the channel (four channel models only) and Verify.



The measurement value and the frequency (Hz) are shown. The meter calibration factors are used when calculating the measurement value.
Press [ENTER] to return to the Measurement mode.

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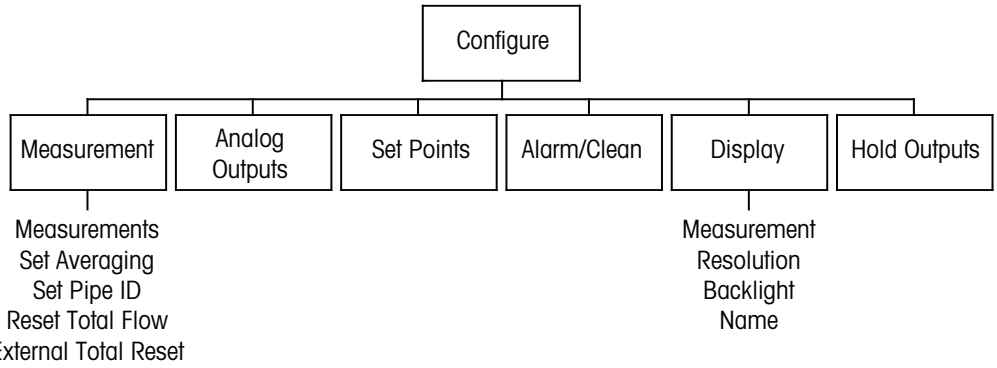
8 Configuration

(PATH: Menu/Configure)



NOTE: Screen shots represent typical single channel displays. Displays for four channel models may vary.

8.1 Enter Configuration Mode

While in Measurement mode press the ◀ key. Press the ▲ or ▼ key to navigate to the Configure – Menu. Select the Configure – Menu and enter the security code "xxxxx" if necessary (see section 9.4). Press the [ENTER] key to confirm the code.

NOTE: to exit Configuration mode at any time press the ◀ and ▶ key simultaneously (escape). The transmitter returns to the Measurement mode and the old settings remain active.

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8.2 Measurement Setup

(PATH: Menu/Configure/Measurement)

Press [ENTER] to select Measurement Menu. The following sub menus can now be selected: Measurements, Set Averaging, Set Pipe ID, Reset Total Flow and External Total Reset.

Press [ENTER] to select Measurements.

Select the type of sensor(s) wired to the transmitter and press [ENTER]. The options are High, Type 2 or Low. See Section 4.5 for sensor types.

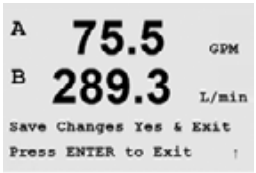
The 4 lines of the display can now be configured with a value. When configuring single channel transmitters, pressing the [ENTER] key will display the selection for lines c and d.

Convention, Single Channel:
1st line on display => a
2nd line on display => b
3rd line on display => c
4th line on display => d

Four channel transmitters allow the configuration of both primary (A, B, C, D) and secondary values (a, b, c, d). Press [ENTER] to display channels B through D.

NOTE: Pressing [ENTER] during normal Measuring mode of four channel transmitters will toggle the display between the Primary and Secondary values.Convention, 4 Channel:

1st line on display => A (a)
2nd line on display => B (b)
3rd line on display => C (c)
4th line on display => D (d)



Pressing the [ENTER] key again will bring up the Save Changes dialog.

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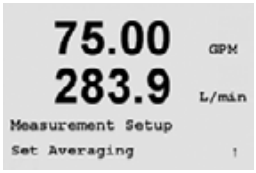
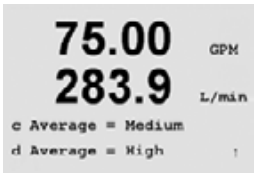
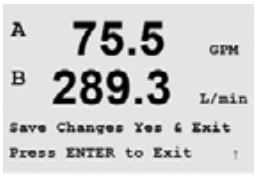
8.2.1 Set Averaging



Press [ENTER] to select this Menu. The averaging method (noise filter) for each measurement can now be selected. The options are Special (Default), None, Low, Medium and High.

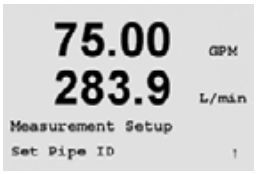
None = no averaging or filtering
Low = equivalent to a 3 point moving average
Medium = equivalent to a 5 point moving average
High = equivalent to a 7 point moving average
Special = averaging depending on signal change (ideal for large changes in input signal). Pressing the [ENTER] key will scroll through the remaining measurements.





Press[ENTER] to bring up the Save Changes dialog. Selecting No will discard the entered values and return to the measurement display screen, selecting Yes will save changes made.

8.2.2 Set Pipe ID

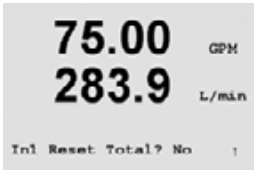


Press [ENTER] key to select this Menu. This menu is used for flow sensors where the inside diameter of the pipe where the flow sensor is installed, is needed to calculate an accurate flow velocity measurement.

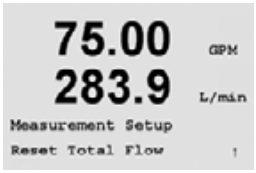
Enter the inside diameter of the pipe. The value can be entered in (inches) or (cm).
Press [ENTER] to configure channels C and D of four channel transmitters.

Press [ENTER]to bring up the Save Changes dialog.

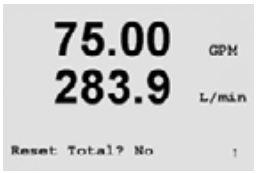
8.2.3 Reset Total Flow



Press [ENTER] key to select this Menu. This menu is used to reset the totalized flow value.

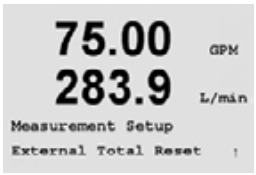


Select Reset Total Yes or No for each sensor channel. Press [ENTER] to display sensor channels C and D of four channel transmitters.



Press [ENTER] to bring up the Save Changes dialog.

8.2.4 External Total Reset



Press [ENTER] key to select this Menu. This menu is used to reset the totalized flow value using the digital input feature of the transmitter.

Select reset total (flow), Yes or No. Four channel transmitters must also select the digital input to use (either 1 or 2). Pressing [ENTER] will bring up channels C and D.

Press [ENTER] to bring up the Save Changes dialog.

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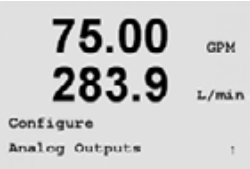
8.3 Analog Outputs

(PATH: Menu/Configure/Analog Outputs)



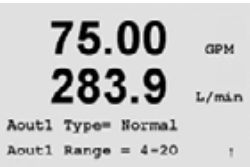
Enter configuration mode as described in Section 8.2

Press the [ENTER] key to select this Menu, which allows configuration of the Analog Outputs Two Analog Outputs are available for single channel transmitters and 4 on four channel units.

Once the analog outputs have been selected, use the ◀ and ▶ buttons to navigate between configurable parameters. Once a parameter is selected, its setting can be selected per the following table:

Parameter	Selectable Values
Aout:	1, 2, 3* or 4* (default is 1)
Measurement:	a, b, c, d or blank (none) (default is blank)
Alarm Value:	3.6 mA, 22.0 mA of Off (default is off)

* Aout 3 and 4 available on two-channel units only



When an Alarm Value is selected, the analog output will go to this value if any alarm condition occurs

The Aout type can be Normal, Bi-Linear, Auto-Range or Logarithmic. The range can be 4–20mA or 0–20mA. Normal provides linear scaling between the minimum and maximum scaling limits and is the default setting. Bi-Linear will also prompt for a scaling value for the mid-point of the signal and allows two different linear segments between the minimum and maximum scaling limits.

Enter the minimum and maximum Value of Aout.

If Auto-range was selected then Aout max1 can be configured. Aout max1 is the maximum value for the first range on Auto-Range. The maximum value for the second range on Auto-Range was set in the previous menu. If Logarithmic Range was selected, it will also prompt for the number of decades as "Aout1 # of Decades =2".

The value for the Hold mode can be configured to hold the last value or can be set to a Fixed value.

Pressing the [ENTER] key again will bring up the Save Changes dialog. Selecting No will discard the entered values and return to the measurement display screen, selecting Yes will save changes made.

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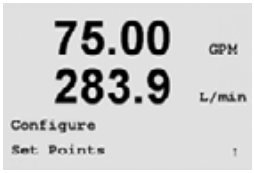
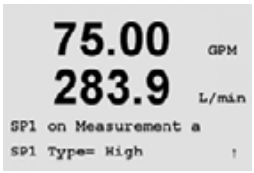
8.4 Set Points

(PATH: Menu/Configuration/Set Points)



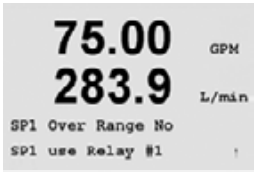
Press the [ENTER] key to select this Menu. This menu is used to configure Setpoints.



Up to 4 Set Points for single channel transmitters and 8 for four channel transmitters can be configured on one measurement on this screen. Types are Off, High, Low, Outside, Between and Total Flow.
Off (Set Point is Off)
High (High value must be set)
Low (Low value must be set)
Outside (High and Low value must be set)
Between (High and Low value must be set)
Total Flow (Available only if units of total flow are chosen. A Total Flow value must be set)

Enter the desired value(s) for the Set Point and press [ENTER].

This screen provides the option to configure a setpoint to be active on an over range condition. Select the setpoint (1 thru 4) and "Yes" or "No". Select the desired relay that will activate when the setpoint alarm condition is reached.



Over Range
Configure whether an over range should also be alarmed and which relay should be used. Once configured, the selected relay will be activated if a sensor over-range condition is detected on the assigned input channel.

Delay
Enter the delay time in seconds. A time delay requires the setpoint to be exceeded continuously for the specified length of time before activating the relay. If the condition disappears before the delay period is over, the relay will not be activated.

Hysteresis
Enter the hysteresis as a percentage-value. A hysteresis value requires the measurement to return within the setpoint value by a specified percentage before the relay is deactivated.

For a high setpoint, the measurement must decrease more than the indicated percentage below the setpoint value before the relay is deactivated. With a low setpoint, the measurement must rise at least this percentage above the setpoint value before the relay is deactivated. For example, with a high setpoint of 100, when this value is exceeded, the measurement must fall below 90 before the relay is deactivated.

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State
Relay contacts are in normal state until the associated setpoint is exceeded, then the relay is activated and the contact states change.

Select "Inverted" to reverse the normal operating state of the relay (i.e. Normally open contacts are in a closed state, and normally closed contacts are in an open state, until the setpoint is exceeded). "Inverted" relay operation is functional when power is applied to the M300 transmitter.

Four channel transmitters also allow configuration of a Relay Hold Status of "Last" or "Off". This is the state the Relay will go to during a Hold status.

Press [ENTER] to bring up the Save Changes dialog.

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8.5 Alarm

(PATH: Menu/Configuration/Alarm)

This Menu allows the configuration of an Alarm.

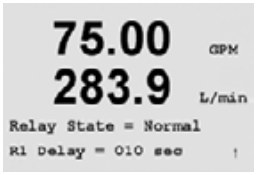
8.5.1 Alarm Setup

To select "Setup Alarm", press the ▲ or ▼ key so that "Alarm" is flashing.

Using the ◀ and ▶ buttons, navigate to "Use Relay #". Using the ▲ or ▼ keys, select relay (1, 2, 3 or 4) to be used for the Alarm and press [ENTER].

One of the following events may be alarmed:

1. Power Failure
2. Software Failure



If any of these are set to Yes then the alarm will come on and an alarm message will be recorded if:

1. there is a power failure or power cycling
2. the software watchdog performs a reset

For 1 and 2 the alarm indicator will be turned off when the alarm message is cleared. It will reappear if the power is constantly cycling or if the watchdog is repeatedly resetting the system.

Pressing the [ENTER] key again will bring up the Save Changes dialog. Selecting No will discard the entered values, selecting Yes will make the entered values the current ones

☞ **Note:** Each Alarm Relay can be configured in either a Normal or Inverted state. In addition, a Delay for the activation can be set. For more information, refer to Section 8.5.

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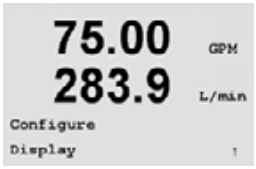
8.6 Display

(PATH: Menu/Configure/Display)



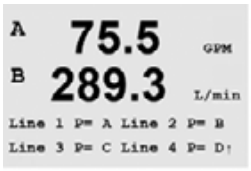
Enter configuration mode as described in Section 8.1.

This Menu allows for the configuration of the values to be displayed and also the configuration of the Display itself.

8.6.1 Measurement

The Display has 4 lines. Line 1 on top and Line 4 on the bottom.

Select the values (Measurement a, b, c or d) to be displayed on each line of the display.



Select the "Error Display" mode. If this is set to "On" when an alarm has occurred, the message "Failure – Press Enter" will be displayed on Line 4 when an alarm occurs in the normal Measurement mode.

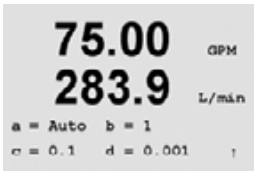
☞ **NOTE:** Pressing [ENTER] during normal Measuring mode of four channel transmitters will toggle the display between the Primary (A–D) and Secondary (a–d) values.

Select the "Error Display" mode. If this is set to "On" when an alarm has occurred, the message "Failure – Press Enter" will be displayed on Line 4 when an alarm occurs in the normal Measurement mode.

Pressing the [ENTER] key again will bring up the Save Changes dialog. Selecting No will discard the entered values, selecting Yes will make the entered values the current ones.

8.6.2 Resolution

This menu allows the setting of the resolution of each displayed value.



Possible settings are 1, 0.1, 0.01, 0.001 or Auto.

Pressing the [ENTER] key Will bring up the Save Changes dialog.

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8.6.3 Backlight

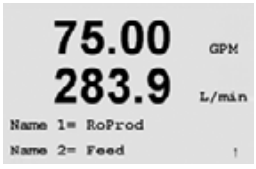
This Menu allows setting the Backlight options of the display.

Possible settings are On, On 50% or Auto Off 50%. If Auto Off 50% is selected then the backlight will go to 50% after 4 minutes with no keypad activity. The backlight will automatically come back on if a key is pressed.

Pressing the [ENTER] key again will bring up the Save Changes dialog.

8.6.4 Name

This menu allows for the configuration of an alpha-numeric name which is displayed on Lines 3 and 4 of the Display. The default is nothing (blank).



Use the ◄ and ► keys to navigate between digits to be altered. Using the ▲ and ▼ keys to change the character to be displayed. Once all digits of both display channels have been entered, press [ENTER] to bring up the Save Changes dialog.

Names can also be displayed on the secondary Measurement mode screen of four channel transmitters. Pressing [ENTER] allows configuration of the secondary names.

Press [ENTER] again to bring up the Save Changes dialog.

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8.7 Hold Outputs

(PATH: Menu/Configure/Hold Outputs)

Enter configuration mode as described in Section 8.2.

The Digital Input used to remotely control the Hold function is configured with this Menu. Initiating a hold condition will maintain the analog signal output and relay status at the value/ state at the time the Hold is initiated, for as long as the Hold state is maintained. In addition, the USB output will be held if the USB Hold option is set to "Last Values". The USB Hold feature is set to "Off" by default. Refer to section 9.2 for more information on the USB settings.

Analog output and relay status will not be held if "No" is selected. If "Yes" is selected, Outputs will be held depending on the status of the selected Digital Input. Digital Input choices are "High", "Low" or "Off". All analog outputs and relay status will be held if the Digital Input is in the selected state. If "Off" is selected as Digital Input status, the Digital Input is inactive and the Hold status will not be triggered through an external signal, although the outputs will be held during configuration or calibration procedures as long as the Hold Outputs option is "Yes".

Press [ENTER] to bring up the Save Changes dialog.

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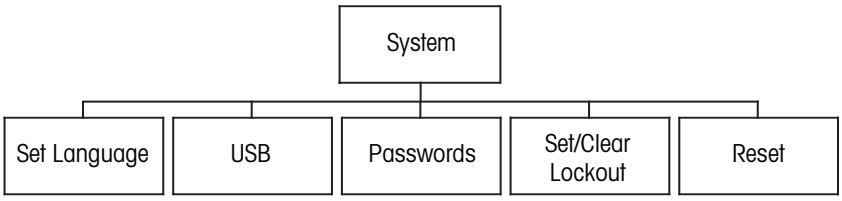
9 System

(PATH: Menu/System)



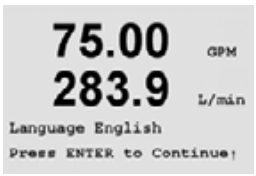
While in Measurement mode press the ◀ key. Press the ▲ or ▼ key to navigate to the System – Menu. Enter the System security code if necessary (see Section 9.3). Press [ENTER].

Refer to section 3.3.2 for information on use of the navigation keys

9.1 Set Language

(PATH: Menu/System/Set Language)

This Menu allows the configuration of the Display language.



Following selections are possible: English, French, German, Italian and Spanish.

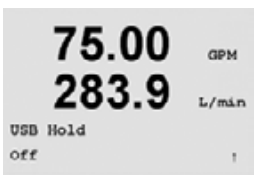
Pressing the [ENTER] key will bring up the Save Changes dialog

9.2 USB

(PATH: Menu/System/USB)

This menu allows configuration of the USB hold function.

This may be set to either Off or Last Values. An external host device may poll the M300 for data. If the USB Hold is set to Off, current values are returned. If the USB Hold is set to Last Values, the values present at the time the hold condition was established are returned.



Details of USB functions and communication protocols are covered in separate documentation.

Press [ENTER] to bring up the Save Changes dialog.

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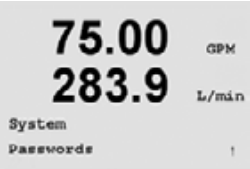
9.3 Passwords

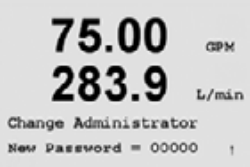
(PATH: Menu/System/Passwords)



This Menu allows for the configuration of Operator and Administrator Passwords, as well as setting up a List of allowed Menus for the Operator. The Administrator has rights to access all Menus. All default passwords for new transmitters are "00000".

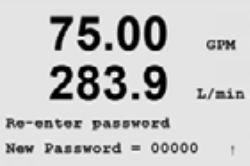
The Passwords Menu is protected: Enter the Administrator Password to enter the Menu

9.3.1 Changing Passwords



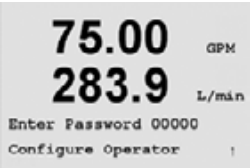
See 9.3 on how to enter the Passwords Menu. Select Change Administrator or Change Operator and set the new Password.

Press [ENTER] to confirm the new password.

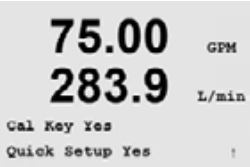


Press [ENTER] again to bring up the Save Changes dialog.

9.3.2 Configuring Menu Access for Operator



See 9.3 on how to enter the Passwords Menu. Select Configure Operator to configure the Access list for the Operator. It is possible to assign/deny rights to the following Menus:



Cal Key, Quick Setup, Configuration, System, PID Setup and Service. Choose either Yes or No to give/ deny access to the above Menus and press [ENTER] to advance to the next items. Pressing the [ENTER] key after configuring all menus will bring up the Save Changes dialog. Selecting No will discard the entered values, selecting Yes will make the entered values the current ones.

Press [ENTER] after configuring all menus to bring up the Save Changes dialog.

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9.4 Set/Clear Lockout

(PATH: Menu/System/Set/Clear Lockout)

The user will be asked for a password before being allowed into any menus if the Lockout functionality is enabled.

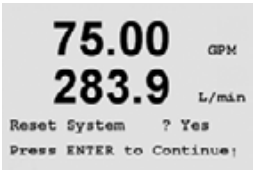
The Lockout – Menu is protected: Enter the Administrator Password and select YES to enable or NO to disable the Lockout functionality. Pressing the [ENTER] key after the selection will bring up the Save Changes dialog. Selecting No will discard the entered value, selecting Yes will make the entered value the current one.

9.5 Reset

(PATH: Menu/System/Reset)

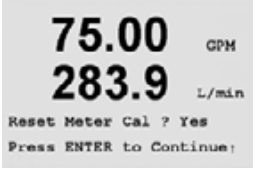
This Menu allows the following options:
Reset System, Reset Meter Cal, Reset Analog Cal.

9.5.1 Reset System

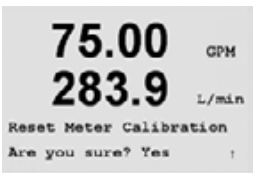


This Menu allows the reset of the meter to the factory default settings (Setpoints off, analog outputs off, etc.). The meter calibration and the analog output calibration are not affected. Pressing the [ENTER] key after the selection will bring up a confirmation screen. Selecting No will discard the entered value, selecting Yes will make the entered value the current one.

9.5.2 Reset Meter Calibration



This Menu allows the reset of the meter's calibration factors to the last factory calibration values.



Pressing the [ENTER] key after the selection will bring up a confirmation screen. Selecting No will discard the entered value, selecting Yes will make the entered value the current one .

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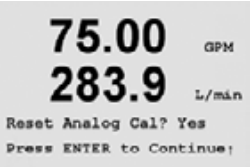
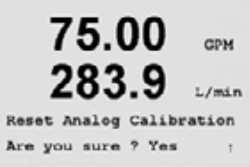
9.5.3 Reset Analog Calibration



This Menu resets the Analog Output calibration factors to the last factory calibration values.



Selecting Yes and pressing the [ENTER] key after the selection will bring up a confirmation screen. Selecting No will discard the entered value, selecting Yes will reset the Analog Output calibration to the last factory setting.

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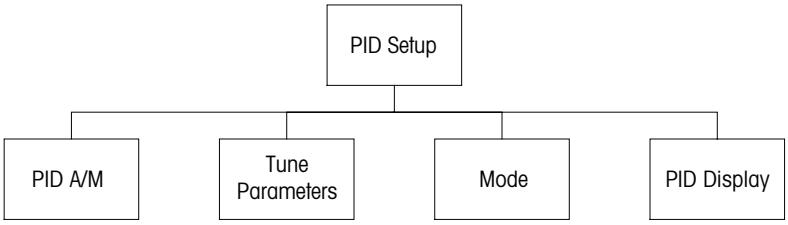
10 PID Setup

(PATH: Menu/PID Setup)

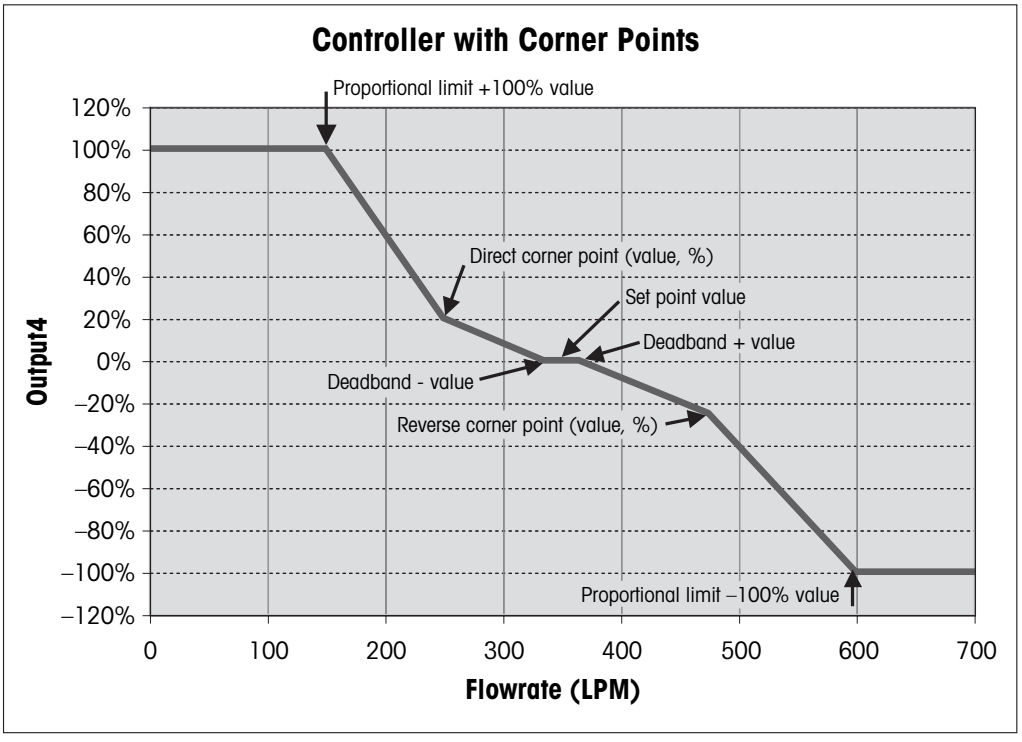


PID control is proportional, integral and derivative control action that can provide smooth regulation of a process. Before configuring the transmitter, the following process characteristics must be identified.

Identify the **control direction** of the process:
Throttling with signal-to-close type valve – direct acting where increasing measurement produces increasing control output
Pump or throttling with signal-to-open valve – reverse acting where increasing measurement produces decreasing control output

Identify the **control output type** based on the control device to be used:
Pulse Frequency – used with pulse input metering pump
Pulse Length – used with solenoid valve
Analog – used with current input devices such as an electric drive unit, analog input metering pump or current-to-pneumatic (I/P) converter for pneumatic control valve

Default control settings provide linear control which is appropriate for flow. The non-linear control settings are used in pH/ORP models of this transmitter. Therefore ignore settings of deadband and corner points in the Tuning Parameter section below.



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10.1 Enter PID Setup

While in Measurement mode press the ◀ key. Press the ▲ or ▼ key to navigate to the PID Setup – Menu and press [ENTER]. Enter the System security code "xxxxx" if required, (see section 9.3) and press the [ENTER] key to confirm the code.

☞ **Note:** to exit PID Setup mode at any time press the ◀ and ▶ keys simultaneously (Escape). The transmitter returns to the Measurement mode and the old values remain active.

10.2 PID Display Auto-Manual

(PATH: Menu/PID Setup/PID A/M Manual)

This menu allows selection of Automatic or Manual operation. Select Auto or Manual operation. Pressing the [ENTER] key will bring up the Save Changes dialog.

10.3 Tune Parameters

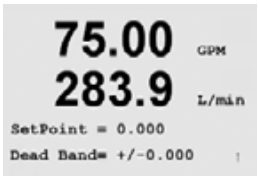
(PATH: Menu/PID Setup/Tune Parameters)

This menu assigns control to a measurement and sets the tuning parameters, setpoint, and non-linear functions of the controller.

10.3.1 PID Assignment & Tuning

Assign the measurement, a, b, c, or d (single channel models) or A, B, C, D, a, b, c, d (four channel transmitters) to be controlled. Set the Gain (unitless), Integral or Reset time, Tr (minutes) and Rate or Derivative time, Td (minutes) needed for control. Press [ENTER]. Gain, Tr and Td are later adjusted by trial and error based on process response. Td is usually left at zero for flow control.

10.3.2 Setpoint & Deadband



Enter the setpoint value and the deadband around the setpoint, where no proportional control action will take place (normally zero for flow). Press [ENTER].

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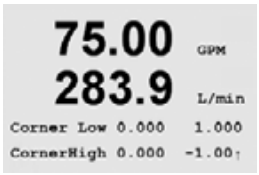
10.3.3 Proportional Limits

Enter the low and high proportional limits – the range over which control action is required. Press [ENTER].

10.3.4 Corner Points



Enter the low and high corner points, in flow units, and the respective output values from –1 to +1, shown in the figure as –100 to +100% (normally left at the default values for flow). Pressing the [ENTER] key again will bring up the Save Changes dialog.

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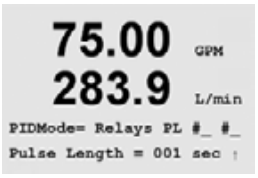
10.4 Mode

(PATH: Menu/PID Setup/Mode)

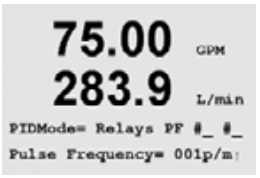
This menu contains the selection of control modes using a relay or analog output.

10.4.1 PID Mode

This menu assigns a relay or analog output for PID control action as well as details of their operation. Based on the control device being used, select one of the following three paragraphs for use with solenoid valve, pulse input metering pump or analog control.

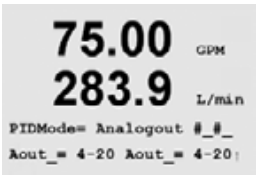


Pulse Length – If using a solenoid valve, select "Relays" and "PL", Pulse Length. Choose the first relay position as #1 if controlling a pump or signal-to-open valve. Choose the second relay position as #2 if controlling a signal-to-close valve. Set the pulse length (feed cycle time) in seconds. A short pulse length will provide more uniform feed. A longer pulse length will reduce wear on the solenoid valve. A value of 10 seconds may be a good starting point. The % "on" time in the cycle is proportional to the control output.



Pulse Frequency – If using a pulse input metering pump, select "Relays" and "PF", Pulse Frequency. Choose the first relay position as #3 if controlling a pump. Choose the second relay position as #4 if controlling a reverse acting pump. Set the pulse frequency to the maximum frequency allowed for the particular pump being used, typically 60 to 100 pulses/minute. Control action will produce this frequency at 100% output.

CAUTION: Setting the Pulse Frequency too high may cause the pump to overheat.



Analog – If using Analog control, change "Relays" to "Analogout". Choose the first Analogout position as #1 if controlling a pump or signal-to-open valve. Choose the second Analogout position as #2 if controlling a signal-to-close valve. Select the analog output current range required by the control device, 4–20 or 0–20 mA.

After assigning the PID control action, pressing the [ENTER] key again will bring up the Save Changes dialog.

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10.4.2 PID Control Tuning

Tuning of the Gain and Tr for complex or critical applications can be difficult. Many textbooks are available for this purpose. For tuning of simple, non-critical applications, the following procedure may be used. The tuning sequence consists of setting initial Gain and Tr values, then adjusting them by trial and error. There is no one set of initial values for Gain, Tr, and Td that will work for all flow control systems. However, Gain of 0.5, Tr of 20 minutes, and Td of 0 is often used to begin the trial and error tuning sequence. It is recommended that Td always be set at 0 for flow control.
Place the output to Manual per section 10.2. Use the ▲ or ▼ keys and set the flow rate to the desired setting. Place the output to Auto. To assure bumpless transfer from Manual to Auto, be certain Tr is NOT at 0. Monitor the flow rate, preferably on a trending recorder. If the flow rate periodically cycles up and down, decrease the Gain value. If the flow rate is steady, increase the Gain in small steps (about 20% of setting) until the flow rate begins to cycle. Note the frequency of the cyclic response by watching two or more cycles. Decrease the Gain until cycling stops.

10.4.2.1 Tr Tuning

Decrease the Tr in small steps (about 20% of setting) until the flow rate begins to cycle at a frequency that is less than that noted in Section 10.3.1. Increase the Tr until the cycling stops. A final value of Tr of 20 minutes may be considered to be little Reset action. A value of Tr of 1 minute may be considered to be significant Reset action.

This completes the tuning process.

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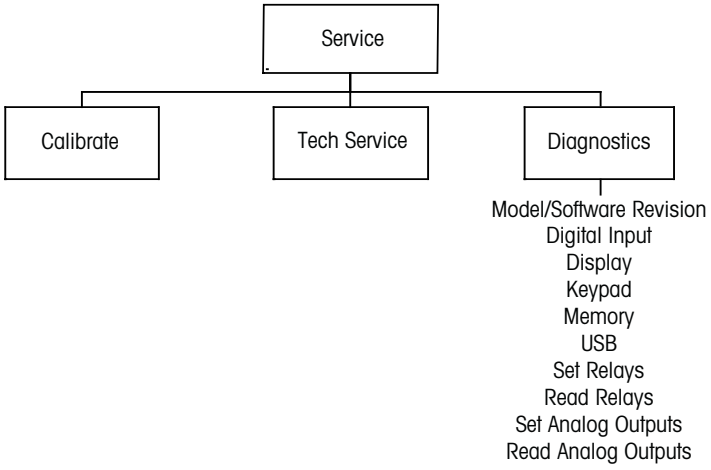
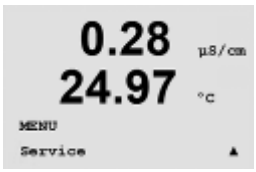
11 Service

(PATH: Menu/Service)





While in Measurement mode press the ◀ key. Press the ▲ or ▼ key to navigate to the "Service" and press [ENTER]. Enter the security code "xxxxx" if required (See section 9.3) and press [ENTER] to confirm the code. The available system configuration options are detailed below

NOTE: to exit Service mode at any time press the ◀ and ▶ key simultaneously (escape). The transmitter returns to the Measurement mode and the old settings remain active.

11.1 Diagnostics

(PATH: Menu/Service/Diagnostics)

This Menu is a valuable tool for troubleshooting and provides diagnostic functionality for the following items: Model/Software Revision, Digital Input, Display, Keypad, Memory, Set Relays, Read Relays, Set Analog Outputs, Read Analog Outputs.

11.1.1 Model/Software Revision

Essential information for every Service call is the model and software revision number. This Menu shows the transmitter part number, serial number and software version number. Press [ENTER] to exit from this display.

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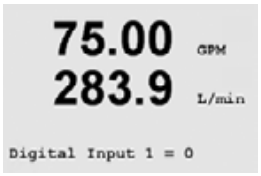
11.1.2 Digital Input

The digital Input menu shows the state of the digital input. Press [ENTER] to exit from this display.

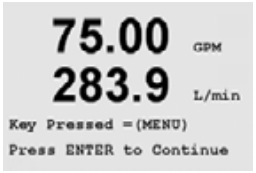


11.1.3 Display

All pixels of the display will be lit for 15 seconds to allow troubleshooting of the display. After 15 seconds the transmitter will return to the normal Measuring mode or press [ENTER] to exit sooner.

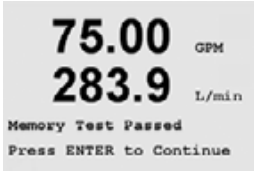
11.1.4 Keypad

For the keypad diagnostics the display will indicate which key is pressed. Pressing [ENTER] will return the transmitter to the normal Measuring mode.



11.1.5 Memory

If Memory is selected then the transmitter will perform a RAM and ROM memory test. Test patterns will be written to and read from all RAM memory locations. The ROM checksum will be recalculated and compared to the value stored in the ROM.



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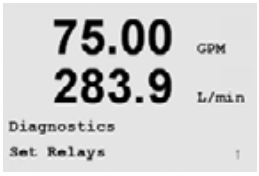
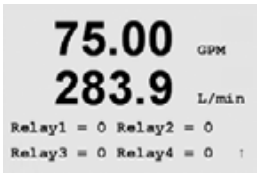
11.1.6 Set Relays



The Set Relays diagnostic menu allows for manual activation/deactivation of each Relay. Relay state can be toggled by selecting the desired value as listed below:

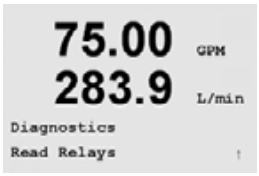


0 = Normal (normally open contacts are open)
1 = Inverted (normally open contacts are closed)

For single-channel units, press the [ENTER] key to return to the Measurement mode.

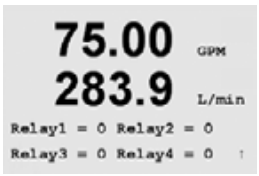
For multi-channel units, relays 1–4 will initially be displayed when entering the Set Relay mode. Press enter to display relays 5–6. Press enter again to return to Measurement mode.

11.1.7 Read Relays



The Read Relays diagnostic menu displays the state of each Relay.

0 = Normal (normally open contacts are open)
1 = Inverted (normally open contacts are closed)

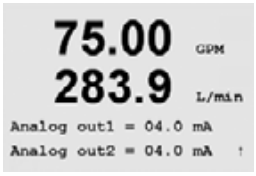


For single-channel units, press the [ENTER] key to return to the Measurement mode.

For multi-channel units, relays 1–4 will initially be displayed when entering the Set Relay mode. Press enter to display relays 5–6. Press enter again to return to Measurement mode.

11.1.8 Set Analog Outputs

This menu enables the user to set all analog outputs to any mA value within the 0–22 mA range.



Pressing [ENTER] on four channel models will display Analog Outputs 3 and 4.

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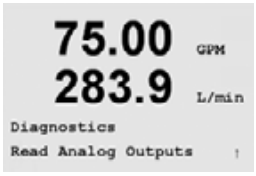
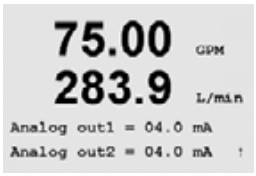
11.1.9 Read Analog Outputs



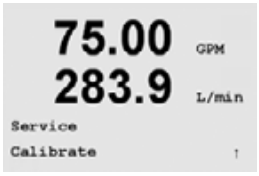
This menu shows the mA value of the analog Outputs.



Pressing [ENTER] on four channel models will display Analog Outputs 3 and 4.

11.2 Calibrate

(PATH: Menu/Service/Calibrate)

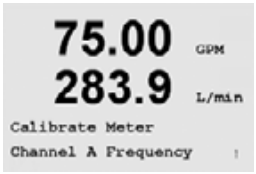


This menu has options to calibrate the transmitter and the analog outputs and also allows unlocking of calibration functionality.

11.2.1 Calibrate Meter

The M300 Flow Transmitter is factory calibrated within specifications. It is not normally necessary to perform meter re-calibration unless extreme conditions cause an out of spec operation shown by Calibration Verification. Periodic verification/re-calibration may be necessary to meet Q.A. requirements.

It is recommended that both calibration and verification be performed using the M300 Flow Calibrator Module Accessory (refer to accessory list, in section 15). Instructions on the use of this accessory are provided with the calibrator module.



When Calibrate Meter is selected, the display will show the channel (user selectable on four channel transmitters) and Frequency, designating that the transmitter is ready to calibrate the input frequency circuit. This frequency calibration requires a 2-point calibration.

Press [ENTER] to begin the calibration process. The desired frequency for the first point of calibration is entered. The 4th line of the display shows the measured input frequency. During calibration, the outputs will default to be held at their current values until 20 seconds after the calibration menu is exited. A flashing H appears in the upper left corner of the display while outputs are held. Refer to Section 8.7 Hold Outputs to change the hold output status.

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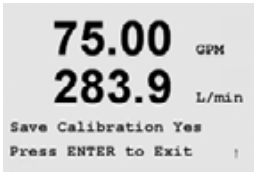
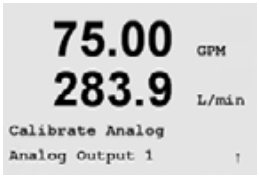
Press [ENTER] to move to the second point of calibration. Again, enter the desired calibration frequency.



Press [ENTER] to complete the calibration process and bring up a confirmation screen. Selecting No will discard the calibration, selecting Yes will save the calibration.

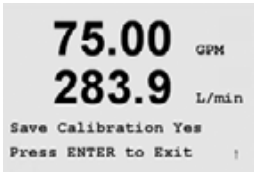
11.2.2 Calibrate Analog



Select the Analog Output you wish to calibrate. Each Analog output can be calibrated at 4 and 20 mA.

Connect an accurate milliamp meter to the Analog output terminals and then adjust the five digit number in the display until the milliamp meter reads 4.00 mA and repeat for 20.00 mA.

As the five digit number is increased the output current increases and as the number is decreased the output current decreases. Thus coarse changes in the output current can be made by changing the thousands or hundreds digits and fine changes can be made by changing the tens or ones digits.



Pressing the [ENTER] key after entering both values will bring up a confirmation screen. Selecting No will discard the entered values, selecting Yes will make the entered values the current ones.

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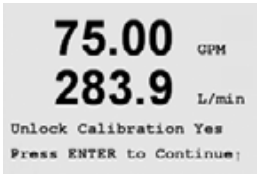
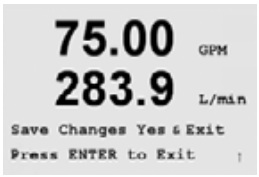
11.2.3 Calibrate Unlock

Select this Menu to configure the CAL Menu, see section 7.



Selecting Yes means that Meter and Analog Output calibration Menus will be selectable under the CAL Menu. Selecting No means that only the Sensor calibration is available under the CAL Menu.



Press [ENTER] to bring up the Save Changes dialog.

11.3 Tech Service

(PATH: Menu/Service/Tech Service)

☞ **NOTE:** This Menu is for Mettler Toledo Service personnel use only.

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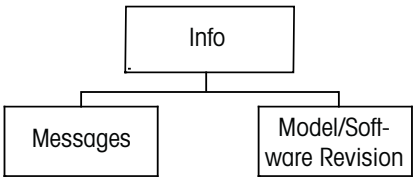
12 Info

(PATH: Info)



Pressing the ▼ key will display the Info Menu with the options Messages and Model/Software Revision.

12.1 Messages

(PATH: Info/Messages)

The most recent message is displayed. The up and down arrow keys allow scrolling through the last four messages that have occurred. If no messages exist the display will state, "No Message Available".

Clear Messages clears all messages. Messages are added to the message list when the condition that generates the message first occurs. If Clear Messages is selected while a message
condition still exists, this message will be cleared from the list. For this message to re-occur in the list the condition must go away and then reappear.

12.2 Model Software/Revision

(PATH: Info/Model/Software Revision)

This displays the model, software revision and serial number of the transmitter.

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13 Maintenance

13.1 Technical Support

For technical support and product information contact:

Mettler-Toledo Thornton, Inc.
36 Middlesex Turnpike
Bedford, MA 01730
Phone: 781-301-8600 or 800-510-PURE
Fax: 781-271-0214
Email: service@thorntoninc.com

Or: Your local Mettler-Toledo Sales Office or representative

13.2 Front Panel Cleaning

Clean the front panel with a damp soft cloth (water only, no solvents). Gently wipe the surface and dry with a soft cloth.

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14 Trouble Shooting

If the equipment is used in a manner not specified by these instructions, the protection provided by the equipment may be impaired.
Review the table below for possible causes of common problems:

Problem	Possible Cause
Display is blank.	– No power to M300 – Blown fuse. – LCD display contrast set incorrectly. – Hardware failure.
Incorrect measurement readings.	– Sensor improperly installed. – Incorrect units selected. – Sensor or transmitter need calibration. – Sensor cord defective or exceeds recommended maximum length. – Hardware failure.
Measurement readings not stable.	– Sensors or cables installed too close to equipment that generates high level of electrical noise. – Recommended cable length exceeded. – Averaging set too low. – Sensor defective.
Displayed ⚠ is flashing.	– Setpoint is in alarm condition (setpoint exceeded).
Cannot change menu settings.	– User locked out for security reasons.

14.1 Changing the Fuse

Make sure the main cable is unplugged before changing the fuse. This operation should only be carried out by personnel familiar with the transmitter and who are qualified for such work.

If the power consumption of the M300 transmitter is too high or a manipulation leads to a short circuit the fuse will blow. In this case remove the fuse and replace as specified in Chapter 16.

15 Accessories and Spare Parts

Description	**Part Number**
Panel Mount Kit for ½ DIN models	52 500 213
Pipe Mount Kit for ½ DIN models	52 500 212
Configuration & Data Logger Software Kit	58 077 300
Adaptor Panel – M300 to 200/2000 cutout	58 083 300
Replacement power fuse 5x20 mm, 1 A, 250 V, time lag, Littlefuse or Hollyland	–

Please contact your local Mettler-Toledo Sales office or representative for details on available accessories and spare parts.

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16 Specifications

16.1 General Specifications

Functional	
Flow rate	0 to 9999 GPM, L/min, m^3/Hr
Total Flow	0 to 9,999,999 Gallons, 37,850,000 Liters, 37,850 m^3
Flow Velocity	Equivalent ft/s, m/s
Frequency	1 to 4000 Hz
Resolution	0.001 Hz
Input pulses	Low < 1.0 Volt; High > 1.4 Volts (36 volts max)
Performance	
Accuracy	± 0.5 Hz
Repeatability	± 0.2 Hz
Update rate	All measurements and outputs every 2 seconds

16.2 Electrical Specifications for 1/2DIN and 1/4DIN Versions

Power requirements	100 to 240 V AC or 20 to 30 V DC, 5 W
Frequency	50 to 60 Hz
Signal output	two (single channel model) or four (four channel model) 0/4 to 22 mA outputs, galvanically isolated
Measurement Error through analog outputs	< 0.5% of full scale
Analog output configuration	Linear, Bi-Linear, Logarithmic, Autoranging
Load	max. 500 Ω
Connection terminals	Detachable screw terminals
Digital communication	USB port, Type B connector
PID process controller	Pulse length, frequency or analog control
Connection terminals	Detachable screw terminals
Digital Input	Single channel = 1, Four Channel = 2
Main fuse	1.0 A slow blow type FC
Relays	2-SPDT mechanical rated at 250VAC, 30 VDC, 3Amps 1 SPST NO , 1 SPST NC, rated at 250VAC or DC, 0.5A, 10 W 2-Read rat4ed at 250VAC or DC, 0.5A, 10W
Alarm Relay delay	0–999 s
Keypad	5 tactile feedback keys
Display	four-line

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16.3 Mechanical Specifications for 1/4DIN Versions

Dimensions (housing – H x W x D)*	90 x 90 x 140 mm (1/4DIN model)
Front bezel – (H x W)	102 x 102 mm
Max. depth	125 mm (excludes plug-in connectors)
Weight	0.6 kg
Material	ABS/polycarbonate
Insulation/rating	IP 65 (front)/IP 20 (housing)

* H=Height, W=Width, D=Depth

16.4 Mechanical Specifications for 1/2DIN Versions

Dimensions (housing – L x H x W)*	144 x 144 x 116 mm
Front bezel – H x W	150 x 150 mm
Max. D – panel mounted	87 mm (excludes plug-in connectors)
Weight	0.95kg
Material	ABS/polycarbonate
Insulation/rating	IP 65

* H=Height, W=Width, D=Depth

16.5 Environmental Specifications for 1/2DIN and 1/4DIN Versions

Storage temperature	–40 to 70 °C (–40 to 158 °F)
Ambient temperature operating range	–10 to 50 °C (14 to 122 °F)
Relative humidity	0 to 95% non-condensing
Emissions	According to EN55011 Class A
UL Electrical Environment	Installation (overvolatge) category II

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17 Default Tables

parameter	sub parameter	value	unit
Language		English	
Passwords	administrator	00000	
	operator	00000	
All Relays (unless otherwise specified)	delay	10	sec
	hysteresis	5	%
	state	normal	
	hold mode	NA	
Lockout	(on/off)	no = off	
Channel A (single channel)	a	flow	gpm
Channel A (single channel)	c	total flow	gallons
Channel A (single channel)	b	(none)	
Channel A (single channel)	d	(none)	
Channel A (four channel)		flow	gpm
Channel B (four channel)		flow	gpm
Channel C (four channel)		flow	gpm
Channel D (four channel)		flow	gpm
Channel a (four channel)		total flow	gallons
Channel b (four channel)		total flow	gallons
Channel c (four channel)		total flow	gallons
Channel d (four channel)		total flow	gallons
cal constants	(for all channels)	M=1.0, A=0.0	
	(for type 2 sensors)	Ks = 100, Fs = 0	If F = 0 then this table is ignored (i.e. it is a type 1 sensor)
	(for type 2 sensors)	M = 60	
Analog Out (single channel)	1	a – flow	
	2	c – total flow	
Analog Out (four channel)	1	Ch A – flow	
	2	Ch B – flow	
	3	Ch C – flow	
	4	Ch D – flow	
all analog out	mode	4–20 mA	
	type	Normal	
	alarm	off	
	hold mode	last	
Flow	value 4 mA	0	
	value 20 mA	100	
Total flow	value 4 mA	0	
	value 20 mA	1,000,000	
Set point 1	signal	a (single channel A (four channel)	
	type	off	
	value	1	

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parameter	sub parameter	value	unit
Relay 1	set point	1	
	delay	10	sec
	hysteresis	5	%
	state	normal	
	hold mode	Last	
Set point 2	signal	c (single channel) B (four channel)	
	type	Off	
	value	1	
Relay 2	set point	2	
	delay	10	sec
	hysteresis	5	%
	state	normal	
	hold mode	last	
Set point 3	signal	(none) (single channel) C (four channel)	
	type	Off	
	value	1	
Relay 3	set point	(none) (single channel) 3 (four channel)	
	delay	10	sec
	hysteresis	5	%
	state	normal	
	hold mode	last	
Set point 4	signal	(none) (single channel) D (four channel)	
	type	Off	
	value	1	
Relay 4	set point	(none) (single channel) 4 (four channel)	
	delay	10	sec
	hysteresis	5	%
	state	normal	
	hold mode	last	
Set points 5–8 (four channel only)	signal	(none)	
	type	Off	
	value	1	
Relay	set point	(none)	
	delay	10	
	hysteresis	5	
	state	normal	
	hold mode	Last	
Alarm	Alarm conditions	All off	
	Relay	No relay assigned	

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18 Warranty

METTLER TOLEDO warrants this product to be free from significant deviations in material and workmanship for a period of one year from the date of purchase. If repair is necessary and not the result of abuse or misuse within the warranty period, please return by freight pre-paid and amendment will be made without any charge. METTLER TOLEDO"s Customer Service Dept. will determine if the product problem is due to deviations or customer abuse. Out-of-warranty products will be repaired on an exchange basis at cost.

The above warranty is the only warranty made by METTLER TOLEDO and is lieu of all other warranties, expressed or implied, including, without limitation, implied warranties of merchantability and fitness for a particular purpose. METTLER TOLEDO shall not be liable for any loss, claim, expense or damage caused by, contributed to or arising out of the acts or omissions of the Buyer or Third Parties, whether negligent or otherwise. In no event shall METTLER TOLEDO's
liability for any cause of action whatsoever exceed the cost of the item giving rise to the claim, whether based in contract, warranty, indemnity, or tort (including negligence).

19 UL Statement

Mettler-Toledo Thornton, Inc., 36 Middlesex Turnpike, Bedford, MA 01730, USA has obtained Underwriters Laboratories' listing for 300 Model Transmitters. They bear the cULus Listed mark, signifying that the products have been evaluated to the applicable ANSI/UL and CSA Standards for use in the U.S. and Canada.

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Notes:

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